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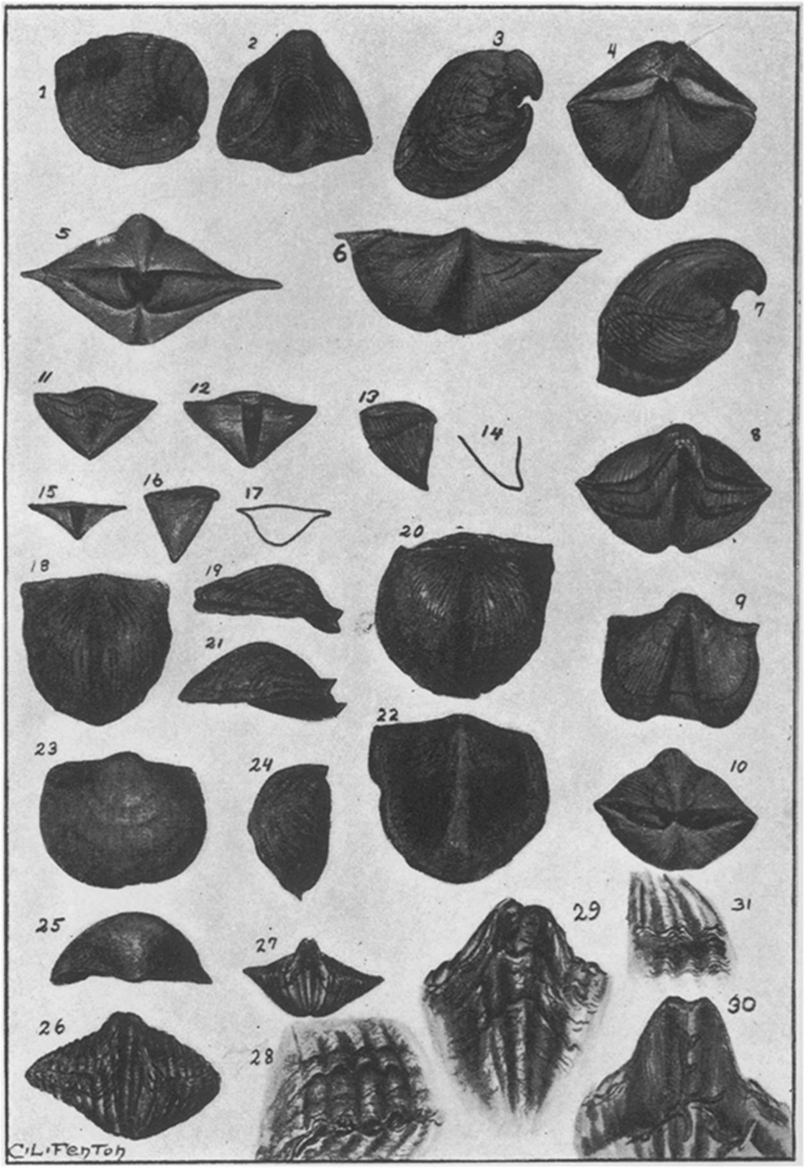

PLATE VIII.—WEBSTER ON NOTES ON THE GENUS ATRYPA.

pustules. The anterior portion is quite smooth, the pustules occupying the center of the shell from the umbones to the ventral margin. The umbones are small, directed anteriorly and marked by heavy ridges. The ligament is a dark horn color, long and wide. The epidermis varies from a dark yellow to a dark brown. The cardinal teeth are single in the right and double in the left valve, flat, large and deeply grooved. The lateral teeth are very strong, and much striated in older specimens. The anterior adductor muscle scar is oval, deeply excavated and markedly striated. The pallial line is deeply impressed anteriorly but almost not at all posteriorly. The nacre varies between a whitish hue in young specimens to a deep purple in older specimens. There is a satin finish near the beaks. The space between the pallial line and the ventral margin is a dark purple, with a thin white line running along the ventral margin.

Length	Height	Diameter
75	64	44
118	90	48
112	90	46
78	63	36
120	91	50

The river area over which collections were made is about six miles in length, extending from a point about two miles south of South Bend to Bertrand, a village just above the Michigan state line.

Notes on the Genus Atrypa, with Description of New Species.

BY CLEMENT L. WEBSTER, M. SC.

INTRODUCTION.

For many years I have been engaged in bringing together from the rocks of all geological ages containing them from various parts of the world, a very large collection of all available species and variations of the Genus *Atrypa*, for the purpose of a monographic revision of the group, and for the further purpose of, in so far as possible, ascertaining the genesis of species of this group. The amount and nature of the material and evidence secured has been very gratifying; and can not but aid somewhat in the solution of at least some of the important questions involved.

Through these studies and collections it has been clearly shown that the species of this genus represent a most wonderful plasticity, and demonstrates more clearly than ever the great difficulty of determining what really does in nature constitute a good "species." It is shown that with every radical (and sometimes relatively slight) change in the deposition and environment in which the various forms we call species, lived, there followed an equally great modification of the forms, and that under these conditions they were remarkably uniform and persistent in their form and character. There is no other group of ancient life perhaps which shows equally well the great plasticity of species (aside from the Stromatoporas and their allied forms) than do the forms of the genus Atrypa. Specific names are here given to certain forms of the genus more for the sake of convenience in reference and to facilitate the further studies of others, rather than to the belief that they always constitute true natural species—in fact I am convinced that in nature, relatively few natural "species," such as have been generally regarded as such, really exist.

Nearly all the Atrypae described in this paper save *A. owenensis*, and *A. subhannibalensis*, have been referred by geologists to *Atrypa reticularis*.

In the following description of forms it will often prove difficult for the student to fully appreciate the importance of the differences existing between them without good illustrations being shown; this, however, will be overcome in the final Monograph of which this paper is to form a part.

DESCRIPTION OF SPECIES.

Atrypa owenensis N. Sp.

Plate VIII. Figs. 12–14.

Shell small usually not over half inch in width; length equal to or considerably greater than width.

Valves usually greatly convex and often nearly equally so; beak sharply incurved; plications rather coarse and transverse annulations or lines of growth prominent. This species is generally unusually constant in form and size, and has a certain phase suggesting *A. impressa* of Hall. This form is gregarious in its habits, and appears to be restricted in its range to a certain limestone bed of the Upper Hackberry Group (the "Owen substage" of Fenton), Owens Grove (south exposure), Cerro Gordo County, Iowa.

Position and locality: Upper Hackberry Group ("Owen substage of Fenton), Devonian, Owens Grove (south exposure) Cerro Gordo County, Iowa.

Now in the author's collection.

Atrypa independensis N. Sp.

Plate VIII. Figs. 4–6.

Atrypa reticularis of Hall—Vol. I, Part 2, page 515, plate 6, fig's. 4 and 5, Iowa Geological Survey 1858.

This species from Independence, Iowa, is described as follows by Hall: "Shell depressed suborbicular in its young state, becoming gibbous and sinuate in its mature condition; hinge line often nearly straight, and almost equalling the width of the shell; valves nearly equally convex in the young state, the dorsal valve becoming more gibbous as the shell advances in age, and sometimes acquiring an undefined mesiul lobe down the centre. The ventral valve, in the young state, has the beak nearly straight and perforated at the apex, becoming incurved and finally closely bent over the beak of the opposite valve: a narrow false area is sometimes observable. Shell broadly and deeply sinuate in front." Striation fine and very numerous.

This species is well marked and quite distinct from other forms in several important respects and constant in form and general expression among themselves.

Position and locality: Hard gray-white limestone of the lower portion of the Middle Devonian, Independence, Iowa, and Solon, Big Bend of Iowa river Johnson County Iowa; as well as the Devonian rocks at "East Point, east side of Lake Manitoba," Canada. All now in the author's collection.

Atrypa expansa N. Sp.

This species possesses the general form and size and very fine striation of *A. independensis* of this paper and occurs associated with it; but differs conspicuously from it and all other forms of this genus by the great development of a "marginal fringe" or "foliated expansion" of the ventral valve, thus attaining a width of 3 1-2 to 5 inches or more. This certainly is a remarkable form, and one not to be confounded with any other. This form has always been referred to *A. reticularis*, but it seems to warrant the distinction of a separate species.

This form occurs frequently at Independence, Iowa, and a few other localities in Iowa, as well as at various localities in the Devonian strata of Canada at Lake Manitoba, Dawsons Bay and other localities. This form and its almost invariable associate *A. independensis*, are remarkably constant in their respective characters. This description is made to include this form from Lake Manitoba, Canada, as well as the Iowa form. This species is illustrated in Plate 37, Fig. 8, Vol. I Part IV, of "Contributions to Canadian Paleontology, 1892"; and also illustrated by Thomas in "Plate VC, Fig's. 1 and 2, Vol. XXIII, of Proceedings of the Iowa Academy of Science, 1916."

Position and locality: Lower part of the Middle Devonian at Independence, etc. Iowa, and the Devonian rocks at Lake Manitoba etc., Canada; specimens from most all these localities being in the author's collection.

Atrypa gigantea N. Sp.

Shell very large—attaining the largest size of any species of this genus known to me; orbicular to sub-orbicular in marginal outline, but sometimes wider than high; dorsal valve strangly and broadly convex above the centre, ventral valve flat or strongly concave; plications very coarse and often bifurcating. The internal structure of the ventral valve is very coarse, strongly marked and the teeth very prominent and stout. This species is very constant in form and expression, and is greatly restricted in its range vertically and horizontally, being confined to a soft granular limestone bed of a dark yellow-brown color, in Johnson County, Iowa.

Position and locality: Known only from the lower part of the Middle Devonian, at Iowa City, Roberts Ferry, Turkey Creek and Linders quarry, Johnson County, Iowa.

Now in the author's collection.

Atrypa waterlooensis N. Sp.

Plate VIII. Figs. 1–2.

Shell orbicular in outline and sometimes a little wider than long; attains a large size; very uniform in size, structure and appearance; hinge line shorter than greatest width of the valves, closed hinge area. Dorsal valve very gibbous at or just above the centre; ventral valve flat, or strongly concave below the umbonal region, but sometimes slightly convex throughout most of its surface. Surface covered by very coarse and distant bifercating plications and usually crossed throughout by prominent lines of growth.

This species is everywhere restricted to a series of soft granular, yellow calcareous limestone beds which on weathering usually break down into a tenaceous yellow clay. The form, structure and general appearance throughout the life history of this species is remarkably uniform and persistent. At Littleton, Iowa, this form generally does not attain so great a size as elsewhere.

Position and locality: In soft, yellow, granular, calcareous' limestone just above the centre portion of the Middle Devonian, at Waterloo, Waverly and Littleton, Iowa.

All now in the author's collection.

Atrypa waterlooensis var. **canadensis** N. Var.

Plate VIII. Fig. 3.

This variety differs from the typical form of *A. waterlooensis* mainly in its generally smaller size and less coarse bifurcating plications; and is of special interest as showing its close relationship with *A. waterlooensis* of the Iowa Devonian.

Position and locality: Blue shales of the Upper Devonian age, Hay River, N. W. Territory, Canada, and Blue shale of Upper Devonian age on Hay River, 40 miles south of Great Slave Lake, N. W. Territory, Canada. Now in the author's collection.

Atrypa lineata N. Sp.

Plate VIII. Figs. 7–8.

Orbicular in outline to sometimes longer than wide. Dorsal valve moderately to strongly convex at or just above the centre and sometimes developing a strong mesial fold at the front of the valve; Hinge line considerably shorter than the greatest width of the valves; area closed and beaks sharply incurved; ventral valve flattened and often concave while somewhat convex below the beak, and sometimes developing a deep mesial sinus in front.

This species generally attains a large size, and throughout its life history, is very constant and uniform in appearance and form., Surface marked by fine striae which often bifurcate, and crossed by more or less numerous annulations of growth.

Position and locality: This form occurs abundantly in a soft granular, yellow calcareous limestone between the two nodular

Stromatopora reefs just below the iron bridge, at Treats quarry, Kelleys Quarry, at Charles City, Iowa, in the upper part of the Middle Devonian.

Now in the author's collection.

Atrypa subhannibalensis N. Sp.

Plate VIII. Figs. 15–16.

Shell of medium size, wider than high, both valves convex; dorsal valve extremely convex with greatest convexity about the centre, prominent elevation in the centre corresponding to a mesial fold and especially strong at the front margin of the valve; cardinal extremities rounded; ventral valve much less convex than the dorsal with a prominent mesial sinus especially well developed on the front margin of the valve; hinge line much shorter than the greatest width of the valves, area closed, beak sharply incurved, perforation of ventral beak not well made out. Surface marked by many strong and prominent imbricating lines of growth, and and at times these lines are marked by broad and slight elevations.

In general appearance this form might be considered as occupying a position between the genus Atrypa and the genus Athyris, although I am convinced it really is referable to the former. In-general appearance and expression also it has a quite strong resem blance to *Athyris Hannibalensis* of the Carboniferous above.

Position and locality: Upper Hackberry Group, (equivalent of the "Owen Sub-Stage" of Fenton) Devonian, Owens Grove (south exposure), Cerro Gordo County, Iowa.

Now in the author's collection.

Atrypa aspera var. *occidentalis*, Hall.

This variety of *A. aspera* occurs abundantly at Independence, Waverly, Janesville, and a few other localities, in Iowa, and is a typical western form. Through the kindness of Professor E. M. Kindle, chief paleontologist of the Canadian Geological Survey, I have received identically the same variety from the upper part of the Manitoba formation (Devonian), Red Deer River, Manitoba, Canada.

This is a fact of much scientific interest. Professor Kindle is now at work on his great collection of Devonian fossils from the Northwest Territory, Canada, and his conclusions on the corelation of fauna—especially as they relate to the fauna of the Canadian and Iowa Devonian—will be awaited with special interest. The prevailing form of *Atrypa aspera* var. *occidentalis* as it occurs in the Iowa Devonian, is illustrated by Hall in Plate 6, Fig's. 3a,—3b, Vol. I, Part I, Iowa Geological Survey, 1858; and in Plate 53A, Fig's, 19-21 Paleontology of N. Y. Vol. 4.

Atrypa lineata var. **inflata** N. Var.

This form differs widely from *A. lieata*, but it has seemed best to consider it as a variety of this species. It is a well marked variety, being very uniform in outline and form; is longer than wide, more or less sharply rounded in front; very evenly and strongly inflated especially the dorsal valve, while the ventral valve sometimes has a broad even concave area in front; beaks small and sharply incurved; perforation small; hinge line less than greatest width of the valves, straight or broadly triangular. Surface marked by fine striae, sometimes implanted and bifurcating.

Position and locality: From lower Stromatopora reef, upper part of the Middle Devonian, at Scriptures quarry and Bloody Run,. three miles southeast from Charles City, Iowa, and from a few other localities in Iowa.

Now in the author's collection.

Atrypa. devoniana N. Sp.

Plate VIII. Figs. 9–11.

Shell ranging from small to medium size, orbicular to suborbicular in marginal outline, and sometimes longer than wide.

Ventral valve flattened or gently concave and much more prominently so in the umbonal region; front part of the valve generally somewhat concave or developing a slight to profound undefined sinus; beak low, sharply incurved, area closed and perforation usually very distinct. Dorsal valve generally very convex especially so just above the centre, and in young and immature forms less prominently so. Surface marked by many fine striae which are increased by bifurcation and implantation, but almost wholly so by the former; and generally crossed by faint or sometimes slightly prominent lines of growth, but sometimes this feature is wanting. This is the most beautiful species of the genus occurring in the Hackberry Group, and is constant in form and expression throughout its life history.

Position and locality: Occurs abundantly throughout the

Hackberry Group in Iowa, especially in the Lower and Middle Hackberry. A closely related variety of this species occurs in the lower and middle Devonian at Independence, and Pine Creek, Iowa.

Now in the author's collection.

Atrypa spinosa var. **lindere** N. Var.

This is a relatively small form, and a well marked western variety at least of the New York A. *spinosa* of Hall; it in fact stands midway between certain of the coarse ribbed Atrypas of the western Devonian which have generally been referred to *A. reticularis*, and the eastern form of *A. spinosa*. It is much smaller and coarser ribbed than the typical forms of this species occurring in the Devonian of the Canadian northwest. It is plano-convex to concavo-convex. It has an extreme width of ½ to 1 inch, is well defined and constant in form and expression.

Position and locality: This form occurs in the lower portion of the middle Devonian at Linders quarry 3 miles north from Iowa City, Iowa, and is sometimes met with at a few other points in Johnson County, Iowa.

Now in the author's collection.

Explanation of Plate.

Figs. 1-2.—*Atrypa waterlooensis*. N. Sp.

Ventral and dorsal views of two specimens of this species.

Fig. 3.—*Atrypa waterlooensis canadensis*. N. Var.

Dorsal view of one specimen of this variety

Figs. 4-6.—*Atrypa independensis*. N. Sp.

Fig. 4. Dorsal view of a specimen of this species in the collection of C. L. Fenton, showing the normal shape of a rather young shell. Fig. 5: Dorsal view of another specimen of this species, showing a less common elongated form. Fig. 6: Cross section of a young shell.

Figs. 7-8.—*Atrypa lineata inflata*. N. Var.

Lateral and dorsal views of a very gibbous specimen of this species in the collection of C. L. Fenton. From the parting between the two nodular Stromatoporoid beds at Charles City, Iowa.

Figs. 9-11.—*Atrypa devoniana*. N. Sp.

Dorsal, lateral and dorsal views of three specimens of this species. Fig. 11 represents the normal size and shape of an adult specimen.

Figs. 12-14.—*Atrypa owensis*. N. Sp.

Lateral, dorsal and ventral views of three type specimens of this species.

Figs. 15-16—*Atrypa subhannibalensis*. N. Sp.

Front and dorsal views of the type specimen.